

# Protective Overlay Coatings for Copper Alloy Rocket Engine Combustor Liners



*APS Materials, Inc.; ASB Industries, Inc.; Innovative Technology, Inc. (dba) Inovati; Plasma Processes, Inc.*

## TECHNOLOGY

This protective overlay coatings technology protects an advanced copper alloy known as GRCop-84 as well as other copper alloy liners in order to retain strength and fatigue properties.

## COMMERCIAL APPLICATION

Overlay coatings have not been developed for GRCop-84 copper alloy liners, so this offers not only a solution to the problem, but also makes GRCop-84 a viable option to use in combustor liners and rocket nozzles. Traditionally, NARloy-Z has been used in these applications. However, due to the irreversible plastic deformation and cracking of the cooling passages after each mission cycle, GRCop-84 has the potential to be more reliable because of its higher thermal conductivity.

## SOCIAL / ECONOMIC BENEFIT

◆ The protective coating is expected to increase liner life, allow the engine to operate at higher temperatures and require less frequent maintenance over the use of an uncoated liner.



- NiCrAlY overlay coatings have been successfully machined without coating debonding
- Cooling channels have been successfully machined on NiCrAlY coated subscale GRCop-84 liners

## NASA APPLICATIONS

- ◆ Incorporating a coated GRCop-84 copper alloy liners into large rocket engines will be significantly more cost effective than the materials currently used.
- ◆ This protective coating will allow for the use of GRCop-84 copper alloy liners to be used in the next generation of reusable launch vehicles.

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